

SUBSTITUTE SPECIFICATION

- Adjustable Electrical Tell Tale Modular unit and external monitor -

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BACKGROUND OF THE INVENTION

The Electrical Tell Tale System for Trailers, Australian Patent No. 833898, and U.S. Patent No. 6,535,113, is a device which monitors the electrical systems of trailers and communicates to the driver of a hauling vehicle if those trailer circuits are operating correctly or are malfunctioning. The Electrical Tell Tale System consists of a main control unit which is mounted at the rear of the vehicle and wired in series with each trailer circuit. From the main control unit is a modular cable which runs to the instrument panel of the vehicle and at this end of the cable is the tell tale monitor which houses a number of light emitting diodes. The light emitting diodes indicate to the driver whether the trailer circuits are functioning correctly.

SUMMARY OF THE PRESENT INVENTION

The addition of the original invention is based on the main control unit and its casing, connections, electronics, and tell tale monitor. The electronics of the original invention are now formed in specific molded and designed "modules" or printed circuit boards (PCBs) which are able to be housed and fitted in any type of common trailer connector, including male, female connectors and adapters. This design forms a new generation trailer connector with an Electrical Tell Tale Safety System combined. Furthermore there has been additions to the electronics of the main control unit in order for the original current sensing switch to become adjustable to differing current loads making it adaptable to light emitting diode (LED) automotive lamps. Finally, an external monitor has been developed in order to be mounted on a caravan or trailer in order for the driver to see it and any people outside the vehicle,

indicating the electrical safety state of the caravan or trailer.

With reference to the original invention, the main control unit was housed in an epoxy filled plastic housing which has two leads coming out either side, and these leads were distributed into connectors to connect the main control unit to the trailer wiring loom of the vehicle. With the addition, the main control unit is now placed at the end of the vehicles trailer wiring harness, actually inside the trailer connector. It can be adjusted to suit different trailer lamp combinations, such as LED lights and an external tell tale monitor has been developed to be used with the new concepts, however, the internal tell tale monitor as in the original patent is fully adaptable and vice versa.

The main control unit's electronic component's, and its main connections are epoxy molded in modules or printed circuit boards which can be a number of differing cut or molded shapes, specific to common trailer connector types. The main connections of the main control unit protrude from the module and are aligned for exact and accurate fit with any trailer connectors. All connections including the tell tale monitor connections are now screw type connections. This design eliminates the need for the vehicles wiring to be modified as the system is now housed in the actual trailer connector and acts as an addition to the vehicle instead of a modification. The module is designed to monitor all trailer connections within the plug or a specified number of connections. The main control unit, and tell tale monitor operate the same sequence as the original invention, however it can now be adjusted using a variable or fixed resistor incorporated after the current sensing coil to monitor any required number of trailer lights instead of the unit being set at a fixed current loading. The tell tale monitor, now external can be mounted on the caravan or trailer and its indicating LED lights, have the same circuit for color combination as in the original invention. The new monitor can be seen in the drivers rear side view mirror and by any passing person to indicate the electrical safety condition to not only the driver themselves but to any external

persons outside the motor vehicle. The addition is a convenient new step in the housing, connections fitment adaptability and visibility of the invented system. A Tell Tale System being part of a trailer connector that is adjustable
5 to any type of trailer lighting combinations that can be used with an external tell tale monitor forms a new age in trailer connections.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1a shows the main circuitry of the main invention showing the
10 main addition of the trailer connector housing and how the connections of the main control unit are now enclosed in the trailer connector housing. The additions to the inventions circuitry are also shown, mainly resistor for the adjustable loading capabilities and resistors for LED protection. This figure also shows the capability of the module monitoring all trailer connections
15 within the plug.

Figure 2 shows the main control unit module for the common type seven pin flat trailer plug and its main connections.

Figure 3 shows the main control unit module for the common type large seven pin round trailer connector and its connections.

20 Figure 4 shows the main control unit module for the common type seven pin round trailer connector and its connections.

Figure 5 shows the standard pin positions of the seven pin flat trailer connector.

Figure 6 shows the outline of a standard seven pin flat trailer connector.

25 Figure 7 shows the connection side of the standard seven pin flat trailer connector.

Figure 8 shows the Main Control Unit Module for the Seven pin flat trailer connector in relation to all other drawings on the page.

30 Figure 9 shows the Main Control Unit Module for the seven pin flat trailer housed in the seven pin flat trailer connector and all of its connections.

Figure 10 shows the pin positions for the large seven pin round trailer connector.

Figure 11 shows the outline of the large seven pin trailer connector.

5 Figure 12 shows the connection side of the large seven pin trailer connector.

Figure 13 shows the Main Control unit module for the large seven pin trailer connector in relation to all other drawings on the page.

10 Figure 14 shows the main control unit for the large seven pin trailer connector housed in the large seven pin trailer connector and all of its connections.

Figure 15 shows the pin positions of the seven pin trailer connector

Figure 16 shows the outline of the seven pin trailer connector.

Figure 17 shows the connection side of the seven pin trailer connector.

15 Figure 18 shows the main control unit module for the seven pin trailer connector with reference to all other drawings on the page.

Figure 19 shows the main control unit for the seven pin trailer connector in the seven pin trailer connector and all of its connections.

Figure 20 shows an example of a standard seven pin flat male plug.

20 Figure 21 shows an example of a standard Large Seven Pin round male plug.

Figure 22 shows an example of a standard seven pin plug.

Figure 23 shows an Example of a Seven pin flat plug to seven pin round plug trailer adapter.

25 Figure 24 shows an example of Seven flat trailer connector to a large seven pin plug trailer adapter.

Figure 25 shows an example of Seven pin plug to large seven pin plug trailer adapter.

30 Figure 26 shows the printed circuit board of the external tell tale monitor.

Figure 27 shows a side view of the new tell tale monitor.

Figure 28 shows the front view of the tell tale monitor and led lights.

Figure 29 shows the complete system and connections.

5 Figure 30 shows the complete system installed on a vehicle and operating.

DETAILED DESCRIPTION OF THE INVENTION

With reference to figure 1a the original inventions circuitry can be seen
10 and its operation is identical to the Australian Patent No. 719780 and U.S. Patent No. 6,535,113 patented design together with the following additions. The original epoxy casing 25 which is now in the form of an accurate molded module or printed circuit board as can be seen in figures 2 to 4. The trailer connector 100 forms the complete housing of the main control unit which
15 encases all connections combining the trailer connector itself and main control unit as one unique device.

Circuits 26 to 60, 27 to 61, 28 to 62, 29 to 63, 30 to 64 and 102 to 114 show the capability of the main control unit module to monitor all connections within the trailer connector. Circuit 102-114 includes current sensing switch
20 106 for the circuit. Light emitting diode 116 is the tell tale monitor for the circuit 102-114. Again the additions of circuit 102-114 and figure 1b showing the additional light emitting diode for the additional circuit demonstrate the capability of the module to monitor all circuits within the trailer connector. Resistors 66 to 70 are also additional to the original invention. Pull down
25 resistors 66-70 are connected to earth 31. Resistors 66 to 70 protect the light emitting diodes 116 and 16 to 19 in the tell tale monitor 14, from illuminating by any interference from external sources such as moisture or feedback. Resistors 71 to 75 are housed in the tell tale monitor 14 to protect the LEDs 116 and 16 to 19 from high current in the case of circuit malfunction or
30 tampering. Resistors 76 to 81 are either variable or fixed resistors that are

placed anywhere in each circuit after the current sensing switches 40, 41, 42, 43, 44 and A5. Resistors 76 to 80 are connected to earth 31 and allow the current sensing switches 40 to 44 and 108 to be adjusted to suit varying
 5 currents of trailer loads 60 to 64 and 114. Resistors 76, 77, 78, 79, 80 and 81 can be fitted inside the main control unit 100 or after the connection block 39 and before connections 60, 61, 62, 63, 64 and 114, providing the resistors to be grounded to earth 31.

Figures 2 to 4 show in detail the modules 118, 120 and 122, their
 10 distinctive outlines 124, 126 and 128 and their connections 130-134, 136-140 and 142-146 for the three common connector types; however the modules can be adapted to suit any trailer connector available.

The connections 130, 132 and 134 are the connections from the trailer wiring harness into the main control unit. These connections also incorporate
 15 the connections for the tell tale monitor. They are of a screw type connector. All connections 130, 132 and 134 incorporate all connections 26 to 31 and all tell tale monitor connections in figure 1a. Connections 134, 140 and 146 are the main control unit connection to the trailer connector itself. These connections are the same as connections 33 to 38 and 110 of figure 1a.
 20 However the locations of these connections are not relevant to connections 33 to 38 and 110 of figure 1a. These connections 134, 140 and 146 are connector pins with ferules that can be placed into the connections of the trailer connector and then tightened.

Figures 5, 6, 7, 8 and 9 describe how the main control unit 118 is
 25 mounted into the standard seven pin flat trailer connector 150, connection side 152 and the standard pin position 148. A new generation trailer connector 154 in figure 9 shows the main control unit 118 of the Electrical Tell Tale Safety System installed. The main connections 134 of the main control unit modular 118 are connected to the main connections of the trailer connector. These
 30 connections are the output for the trailer circuits as in 33 to 38 and 110 of

Figure 1a. The connections 130 and 132 A80 to A89 are for all connections from the vehicle to the trailer connector, and also all tell tale monitor connections. It can be seen that the main control unit module 118 fits neatly into the connector 150 and forms one complete unit 154.

Figures 10 to 14 demonstrate how the main control unit module 120 for the large seven pin round trailer connector 156 is fitted into the connector. The pin positions 158 of the common large seven pin connector 156 and the connections side 160 where the main control unit 120 is mounted are shown in Figures 10 and 12. Figure 14 shows the complete new generation connector 162 with the main control unit module 120 connected. Connections 138 and 136 are made to the vehicle trailer wiring harness and the tell tale monitor and the connections 140 are the main connection from the main control unit module 120 to the connector itself. These are the output for the trailer circuits when connected. It is again seen the main control unit module 120 is aligned and fits neatly into the connector housing and the connections 140 are accurately positioned.

Figures 15, 16, 17, 18 and 19, is a description similar to the two previous, however this time the main control unit module 128 is housed in a seven pin round trailer connector 162, with pin positions 164 and connection side 166. The complete unit 168 with the main control unit module 128 connected and forming part of the connector is shown in Figure 19. The connections from the vehicle wiring harness and tell tale monitor and are of screw type. The connections 146 from the main control unit 128 to the trailer connector at 166 connect to the trailer circuits.

The main control unit module 128 is aligned neatly to form the new connector 168 and all connection are positioned accurately.

The main control units modules in figures 2, 3, and 4 have the ability to be mounted into any designed trailer connector, such as the trailer connector plugs 150, 156 and 162 and form part of it. Figures 23, 23 and 25 show

adapters 170, 172 and 174. Also the main control unit is able to be monitored in these types of trailer connections.

Figure 26 shows the printed circuit board 176 of the external tell tale monitor 178 shown in figures 27 and 28. This is respective to tell tale monitor 14 in figure 1a. The printed circuit board 176 is inserted within the tell tale monitor 178. The light emitting diodes 180 are respective to light emitting diodes 116 , 16 to 19 in figure 1a. The light emitting diodes 180 are different colored respective of each circuit in the original invention. The order of the circuit/LED combination on the tell tale monitor 178 can be in any order. The colors of LED lights 180 may be red for brake light circuit, green for turn indicator circuit, amber for clearance light circuit and blue for electric brake circuit.

Figure 29 shows the invention completely connected, the main control unit 100 housing the main electronics as in Figure 1a. This is connected to a modular cable 182 respective of cable 23 in Figure 1a. The other end of cable 182 is connected to the PCB 176, which is housed in the external tell tale monitor 178. From the main control unit 100, a seven core cable 184 is connected. The cable 184 carries all wires 33 to 38 and 110 in Figure 1a. The opposite end of the cable 184 is connected to the trailer lights 186, which are lights 60 to 63 in Figure 1a. All wire connections within the tell tale monitor 178 and the control unit 100 are screw type onto the PCB as shown in Figures 2 to Figure 4.

Figure 30 shows the positioning of the main components and the operation on the vehicle. The vehicle 188 has its right indicator 190 on. Normally this causes the appropriate trailer lamp 186 to flash providing they are working correctly. The external monitor 178 is fitted at point 192 on the caravan 194. The main control unit 100 is fitted at point 196 to replace a normal trailer connector. Main control unit 100 can either be a male or female plug. The driver 198 can see that the light is working on the caravan 194 by

looking at the tell tale monitor 178 in the rear view mirror 200. The tell tale monitor 178 illuminates to indicate that that circuit is functioning correctly. It achieves this by the circuitry of figure 1a, which is housed inside the connector on PCBs as in Figure 2 to Figure 4. In the case of the trailer lights not
5 operating, the appropriate LED 180 would not work and the driver would see no illumination from the LED indicating that the trailer light is malfunctioning. This is achieved by the circuitry shown in Figure 1a.

In all cases the main control unit module is able to be mounted into any
10 existing and yet to be manufactured trailer connector by its specific molded designed and aligned connector pins, forming part of the connector/adaptor itself . Together with the external tell tale monitor as described, this system changes the normal plugs operation to a complete unit that is able to monitor the condition of all of the connections and circuits of the trailer connector
15 itself, this in turn forming a new generation trailer connector in the interests of road safety.